Magnetic Resonance Absorption of Asbestos with 3 cm Wave

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NOTE

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We have noticed that some of the materials known commercially as "asbestos" are influenced by a magnetic field. By this fact we were induced to study a magnetic resonance absorption of asbestos. A very broad absorption curve was obtained, when we performed an experiment on the asbestos crammed into a waveguide section by applying a microwave magnetic field and a d. c. magnetic field which was perpendicular to the former.

Then we tried to make more precise measurements on certain Canada asbestos which is considered to have a typical fibrous structure.

The structure of chrysotile, a kind of asbestos, $(OH)_6Mg_6\ Si_4O_{11}\cdot H_2O$ is such that Mg atoms and O atoms which surround the former are arranged as in brucite.[1] Our X-ray photograph of Canada asbestos is similar to one of the photographs of chrysotile reported by Warren and Bragg, so Canada asbestos has a fibrous structure as chrysotile. But Canada asbestos contains no small quantities of Cu, Ti and Fe additionally. From the results of our experiments the following two points are not clear, and must be pursued: the first is whether or not Canada asbestos has such a structure that Mg ions of chrysotile are replaced by paramagnetic ions of Cu, Ti and Fe, and the second is how the Fe ions, which do not replace Mg ions, are arranged.

Our experiments have been performed as follows: We observed the relative absorption of the asbestos pasted on the wall of a cavity with 3 cm wave. The results have shown a distinct anisotropy and both paramagnetic and ferromagnetic absorption characters. The relative absorption curves are shown in Figs. 1 and 2.

Moreover, the observed magnetization is not proportional to the applied magnetic field and shows saturation-like inclination.

We have estimated the magnetization to be of the order of 1 e. m. u. per gramme. In Fig. 1, curves (1) and (2) are ferromagnetic-like and curve (3) paramagnetic-like.

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From the descending character of the curves in Figs. 1 and 2, the existence of the self-magnetic field in asbestos is evident. To explain this character, the possible existence of magnetic microcrystals may be considered, but our X-ray photograph did not confirm it, though the longtime exposure of X-ray might have shown it.

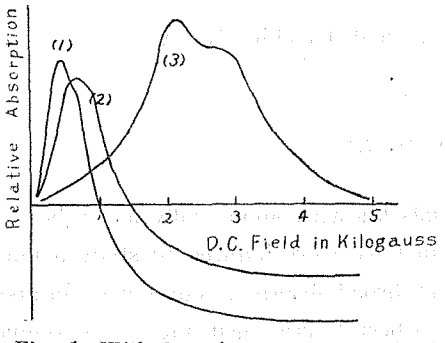

Fig. 1. With the microwave magnetic field perpendicular to the d. c. magnetic field.

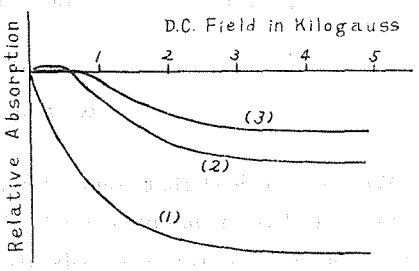

Fig. 2. With the microwave magnetic field parallel to the d. c. magnetic field.

Curves (1), (2) and (3) correspond to the angles of the fibre axis with the d. c. magnetic field 0°, 45° and 90° respectively.

From our results so far, the above-mentioned two points can not be made clear. We are carrying on our experiments to reveal the structure of asbestos.

REFERENCE

(1) Warren and Bragg, *Z. Krist.* **76**, 201 (1930).